Digiflex® Digital Servo Drive Startup Guide

DR100 and DQ111 Series DriveSuite Software

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Foreword

This interactive guide will provide an overview of connection and basic setup instructions for Advanced Motion Controls DR100 and DQ111 Series Digiflex® digital servo drives, using the DriveSuite software. The basic setup of a Digiflex® drive is designed to be analogous to the set up and tuning of an analog amplifier. These instructions will walk you through the following steps necessary to start up your drive and motor:

1. Connect to a drive
2. Enter motor data
3. Set current, voltage, position and temperature limits
4. Tune the drive current control loop
5. Determine motor commutation (brushless and linear motors)
6. Tune the drive velocity control loop (if necessary)
7. Tune the drive position control loop (if necessary)
8. Analog command setup

These instructions are written for use with either a brush type motor or a brushless motor with any of the following feedback sources:

- Encoder with hall sensors
- $1V_{p-p}$ sin/cos encoder with hall sensors
- Encoder only
- $1V_{p-p}$ sin/cos encoder only
- Resolver

Save your project often to the Drive Suite\My Projects directory.

Assistance for topics not covered in this guide is available through any of the following:

- DriveSuite Help files
- www.a-m-c.com
- Technical Assistance via phone: 805-389-1935
- Technical Assistance via e-mail: techsupport@a-m-c.com.

Connect to a Drive

1. Install the AMC DriveSuite software onto your PC.
2. For a DR100 Series Digiflex® drive, connect an available RS-232 communications port on your PC to the CN1 ,9-pin female Sub-D connector. Use a straight-through cable (not null-modem.)
3. For a DQ111 Series SynqNet™ Digiflex drive, connect the SynqNet controller to the CN1 (RJ-45) connection.
4. Connect motor feedback (hall sensor, encoder, resolver), as applicable, to the corresponding pins on the CN3 connector (CN4 connector for DQ111 series).
5. If desired, connect an Inhibit/Enable circuit to one of the Programmable Digital Input pins on the CN2 Connector (CN3 for DQ111 series). See the appropriate product data sheet for digital input specifications.
6. Connect the motor phase wires to the MA, MB, and MC terminals on the P1 connector.

   Note: if using a brush type motor, connect to MB and MC terminals.
7. Apply power to the drive.
8. Double click on AMC_DriveSuite.exe to start the setup software.

For the DR100 Series Digiflex® drives, proceed as follows. For DQ111 Series SynqNet™ drives, proceed to step 12 on page 8:

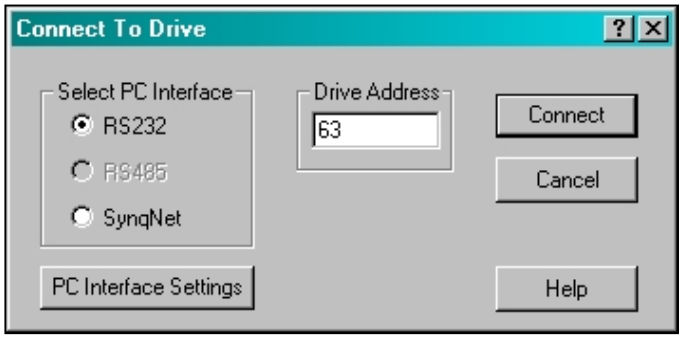
9. At the opening screen, select *Connect to a drive* and click "OK".

10. To determine the appropriate communications settings and connect to the drive, perform the following steps:

    a. Click *PC Interface Settings* to open the RS-232 Settings dialog box.

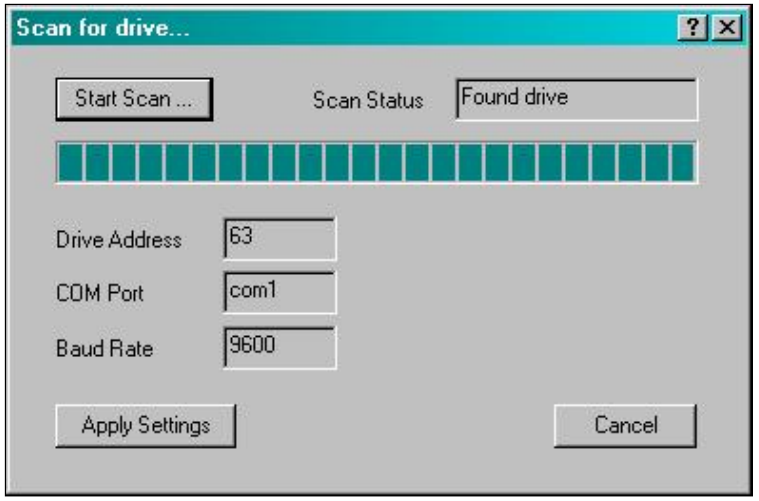
    b. Click *Auto Detect* to automatically detect your PC communications settings.

    Note: Drive communications default baud rate is 9600 bps.

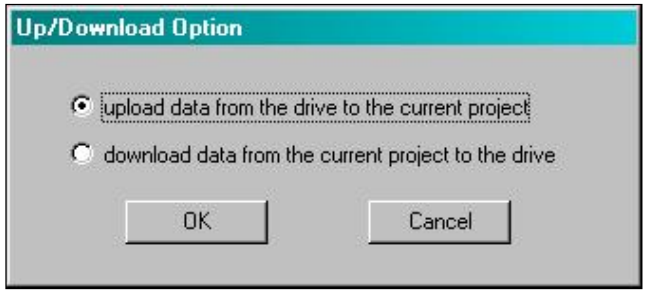


c. Click *Start Scan* to begin the detection process.

d. When complete, click *Apply Settings*, then *Connect* in the Drive Connection window.



e. If connecting for the first time, select *Upload data from the drive to the current project*. You are now connected to the drive. The status indicators on the bottom right corner of the DriveSuite main window should indicate "BRIDGE DISABLED" and "CONNECTED."


Up/Download Option
upload data from the drive to the current project
download data from the current project to the drive
OK
Cancel

11. To change the communications baud rate, perform the following steps:

    a. On the Menu bar, select *Communication* → *Connect* (or click the *Connect* icon)

    b. Click the *PC Interface Settings* button to open the RS-232 Settings window.

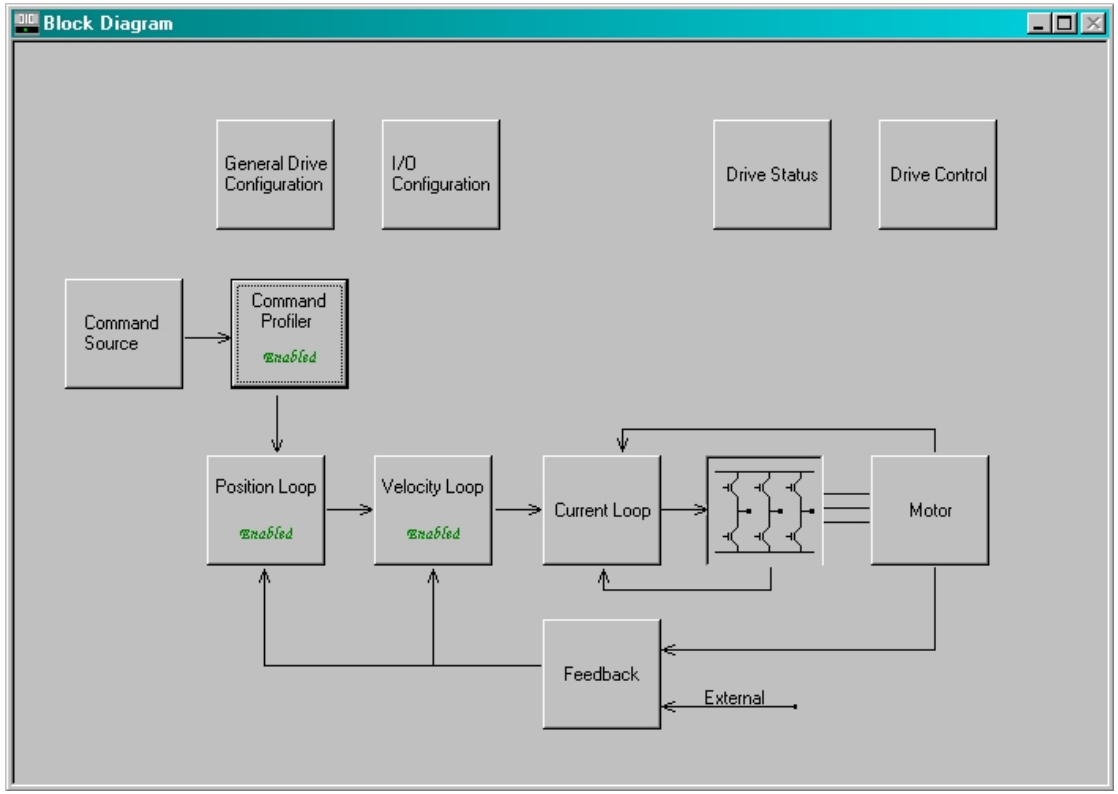
    c. Select the appropriate baud rate.

    d. Click *Connect* in the Drive Connection Window to set the selected baud rate.

    e. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.

Note: Some PC's may not communicate reliably at higher baud rates. If increasing the communications baud rate results in communications errors, use a lower rate.

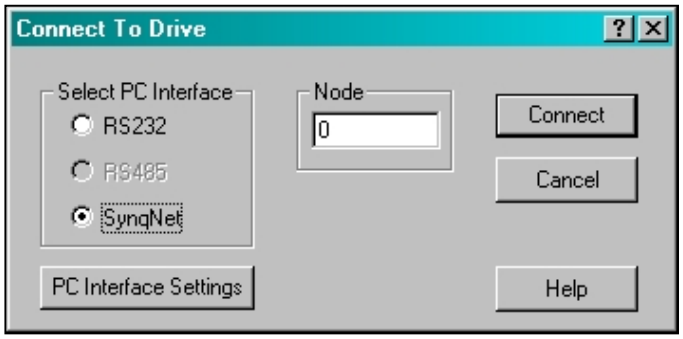
12. Proceed to "Enter Motor Data" on page 9.



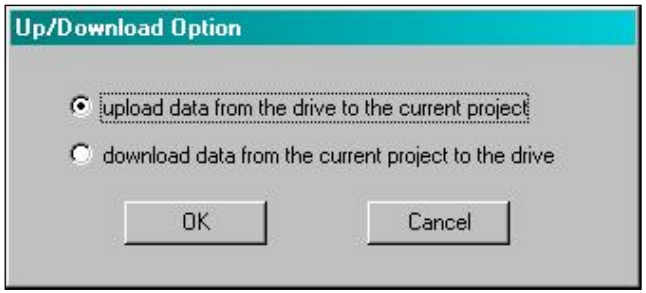
To connect to a DQ111 series SynqNet™ servo drive, proceed as follows:

12. Establish SynqNet™ communications with the drive using Motion Engineering's Motion Console software.
13. At the opening screen, select *Connect to a drive* and click "OK".

14. Under *Select PC Interface*, select *SynqNet*.
15. Enter the appropriate SynqNet™ *Node* number (normally zero if the drive is the first device on the network).
16. Click *Connect*.

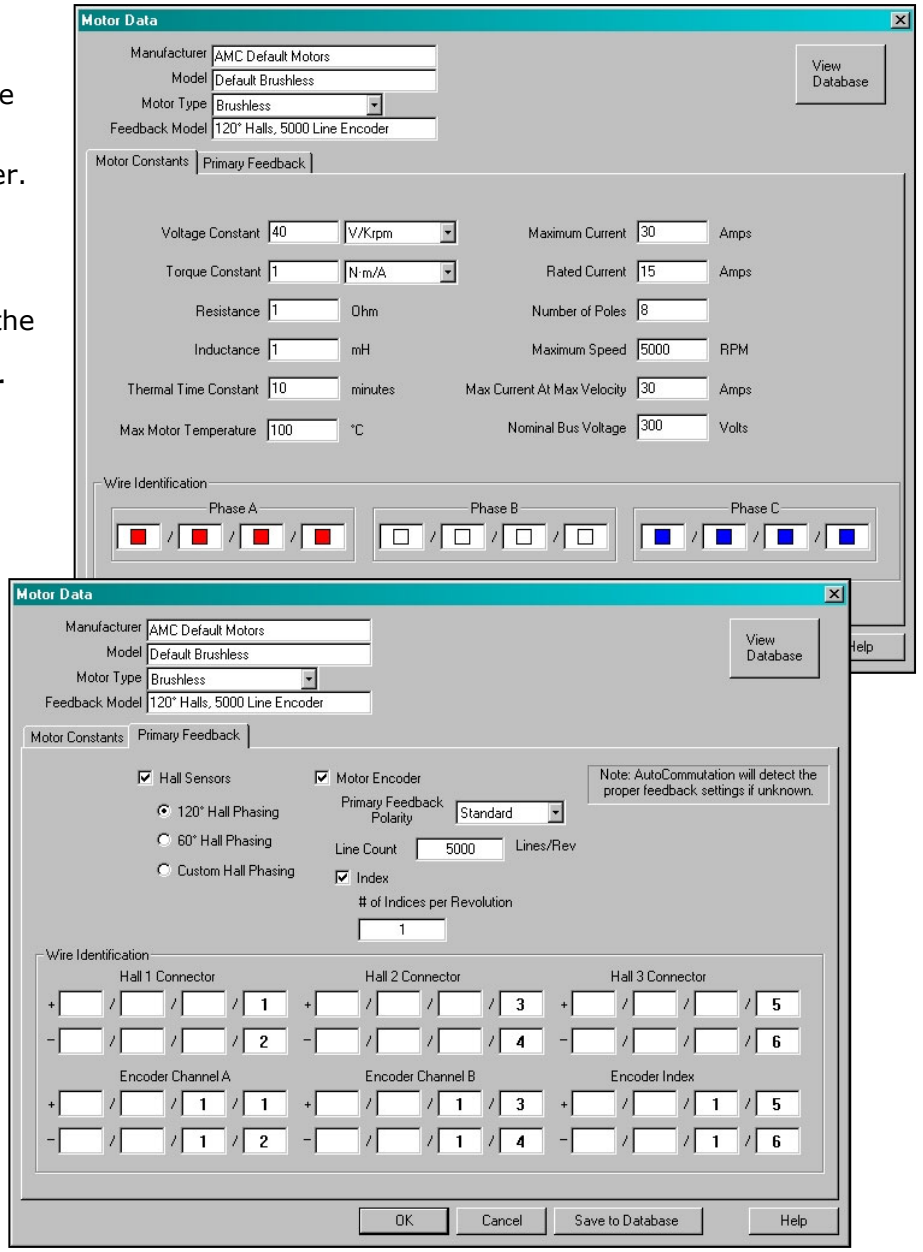


17. If connecting for the first time, select *Upload data from the drive to the current project*. You are now connected to the drive. The status indicators on the bottom right corner of the DriveSuite main window should indicate "BRIDGE DISABLED" and "CONNECTED."


Up/Download Option
upload data from the drive to the current project
download data from the current project to the drive
OK
Cancel

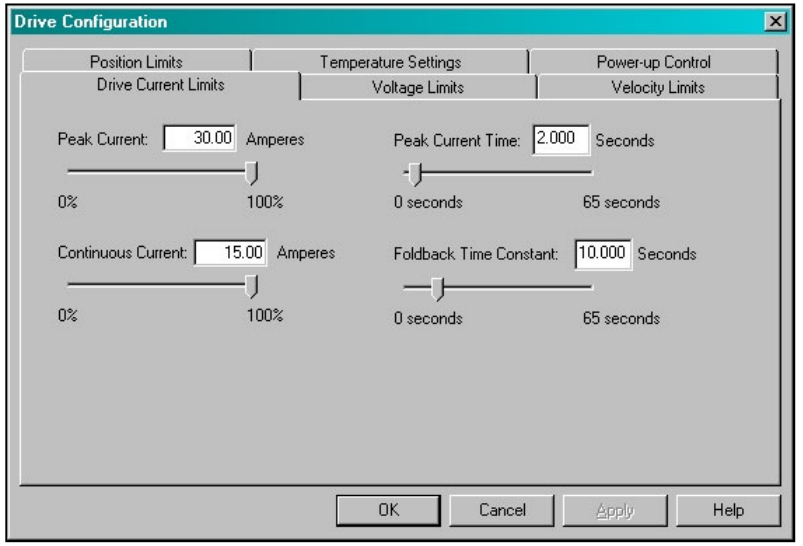
Enter Motor Data

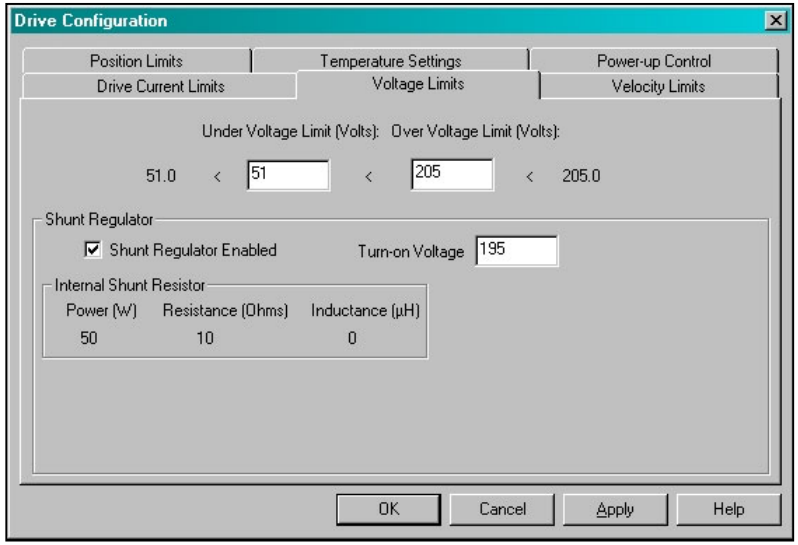
1. In the Block Diagram window, select *Motor* to open the Motor Data window.
2. Enter the *Manufacturer* name and motor *Model* number.
3. Select the appropriate *Motor Type*.
4. Select the *Motor Constants* tab.
5. Enter data from the applicable motor data sheet into the appropriate block in the Motor Data window. **The following *Motor Constants* fields are required for proper operation**:
    a. Maximum Current
    b. Rated Current
    c. Number of Poles
    d. Maximum Speed
6. If desired, select the appropriate color or numerical wire designations in the *Wire Identification* section.
7. Select the *Primary Feedback* tab.
8. Enter accurate Hall Sensor and Encoder data **(required)**.
9. For motors with Resolver feedback, select either low- or high-resolution interpolation. (See the appropriate drive data sheet for resolution options.)
10. To save the motor data to a local data base on your PC, click *Save to Database*.
    a. Saved motor data can be recalled by clicking *View Database*.
11. If desired, select the appropriate color or numerical wire designations in the *Wire Identification* section.
12. Click OK to close the Motor window (this will automatically save the motor data to the drive nonvolatile memory).



Set Current, Voltage, Velocity, Position, and Temperature Limits

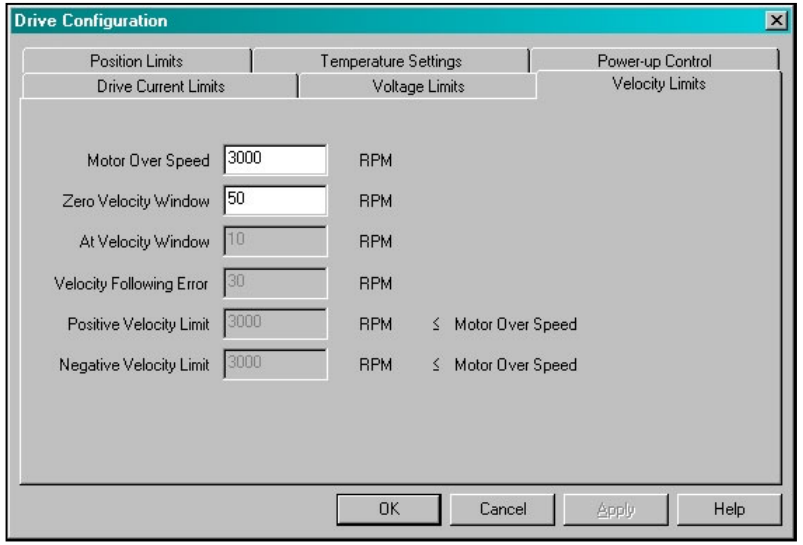
1. In the block diagram window, select *General Drive Configuration*.
2. Set the peak and continuous current limits based on those indicated in the motor data sheet.
3. Set the maximum peak current time and foldback time constant based on system requirements and motor data sheet.
    a. Foldback time constant is the time, in seconds, for the linear decrease from the amplifier peak current setting to the amplifier continuous current setting.
4. Select the *Voltage Limits* tab.
5. Set the Over- and Under-Voltage limits based on system requirements.
6. If available, set the Shunt Regulator turn-on voltage (model dependant)
    a. Note: If unsure, set approximately 10V above nominal bus voltage.
7. If necessary, set the External Shunt Resistor specifications (model dependant).
8. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.





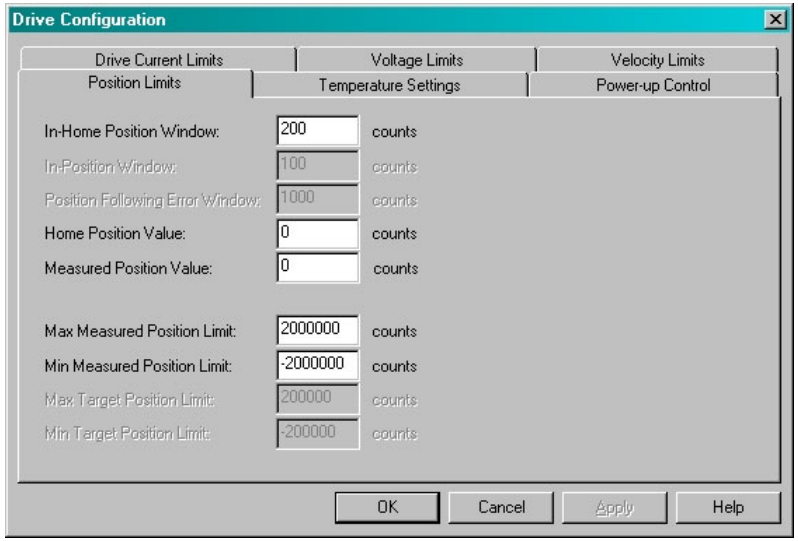
9. Select the *Velocity Limits* tab
10. Enter values for the *Motor Over Speed* and *Zero Velocity Window* (in rpm).

    Note: The value for *Motor Over Speed* is limited by the motor *Maximum Speed* value in the *Motor Data* window.

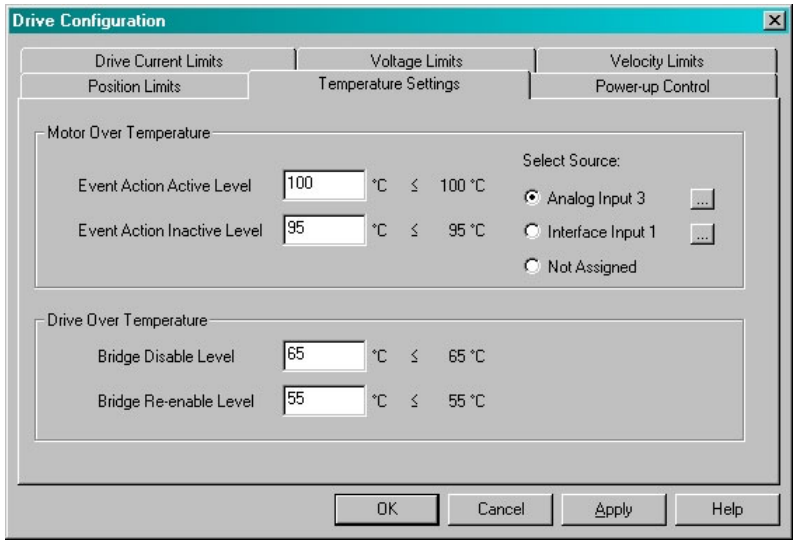


11. Select the *Position Limits* tab.
12. Enter values for *Max* and *Min Measured Position Limit*.

    Note: For general tuning purposes, the other *Position Limit* fields can be left in their default values.

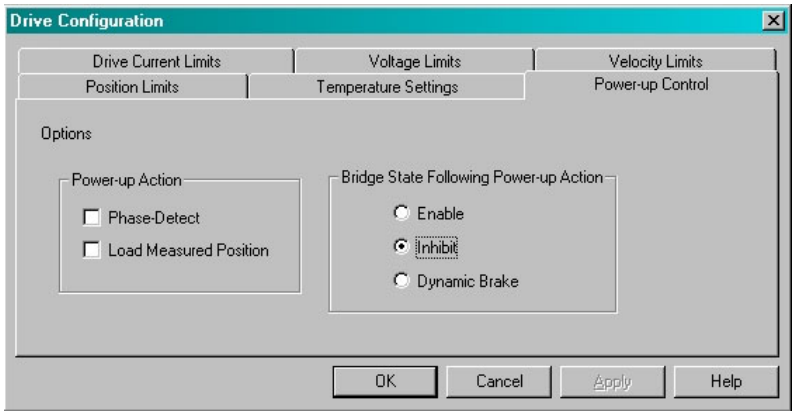


13. Select the *Temperature Settings* tab.
14. Set the *Motor Over Temperature* setpoint for *Event Action Active* and *Event Action Inactive*.
    a. Note: Maximum motor temperature is determined by the value entered into the *Motor Data* window.
15. Select the input source for motor temperature.
16. If available, set the values for User *Drive Over Temperature* (model dependant).
17. Continue to the next section, *Power-Up Options*, on page



Power-Up Options

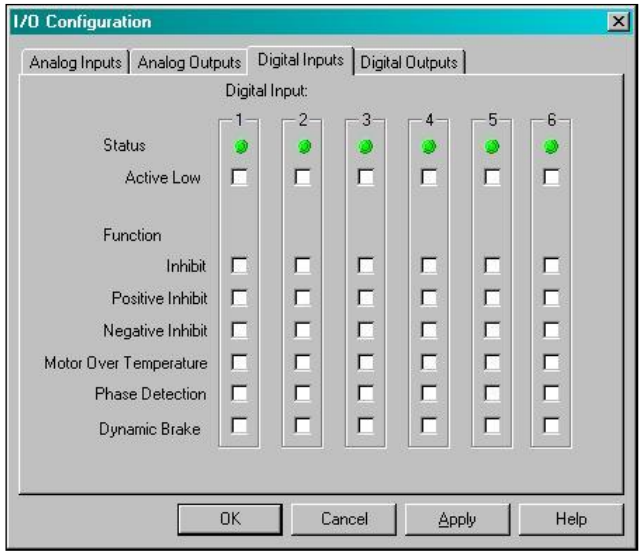
1. If not already open, select *General Drive Configuration* in the Main Block Diagram.
2. Select the *Power-Up Control* tab.
3. Select the *Power-up Action*, if any, that you would like to occur on power-up. (Optional)
4. Select the desired *Bridge State Following Power-up Action* (e.g. drive enabled, drive inhibited) that you would like to occur after the *Power-up Action*, if any, has completed.
5. Click *OK* to accept the data entered.
6. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.



Current Loop Tuning

<u>Caution</u>: Disconnect motor from the load and secure the motor. Sudden motion will occur.

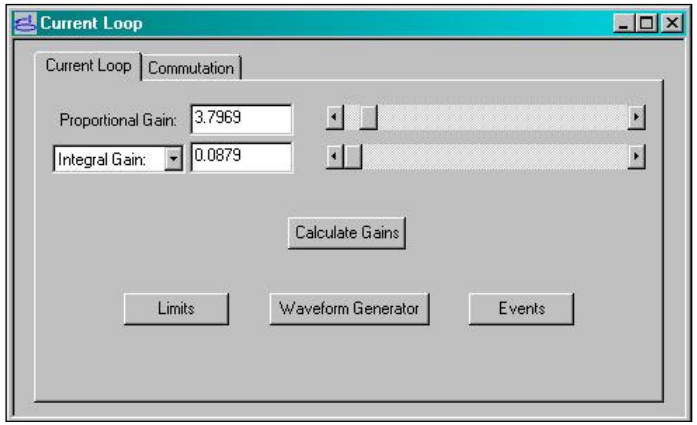
1. **For the DR100 Series Digiflex® drives, set up for tuning as follows**:
    a. Click the I/O Configuration Block
    b. Select the *Digital Inputs* Tab
    c. If an external Inhibit/Enable circuit is used during setup, use the check boxes to assign the Inhibit function and proper polarity (e.g. active high or active low) to the appropriate Digital Input channel.
    d. If no external Inhibit/Enable circuit is used during setup, clear check boxes for all inhibits. Inhibit/Enable will be controlled solely through the DriveSuite *Enable/Disable Drive* icon /.
    e. Continue to step 3.



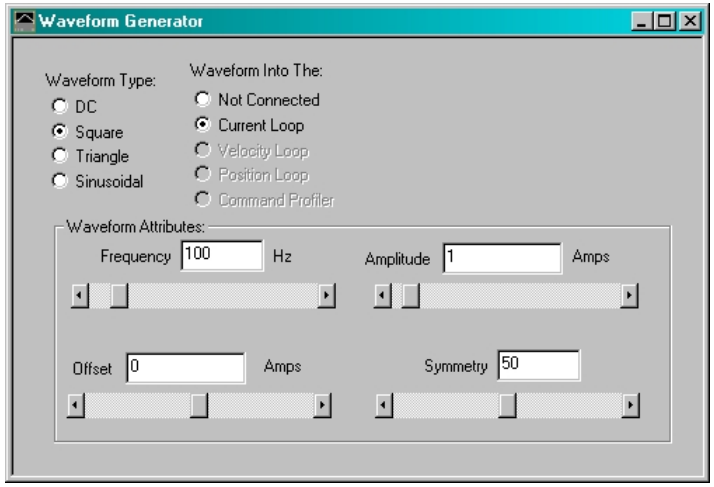
2. **For the DQ111 Series SynqNet™ drives, set up for tuning within MEI Motion Console as follows:**
    a. Set the *Output Limit* in the Filter window to zero.
    b. Set the *Error Limit Action* to "None"
    c. Clear any faults.
    d. Set the *Drive Enable* check box.

Note: Consult the Motion Engineering documentation or Motion Engineering Technical support for assistance with Motion Console.

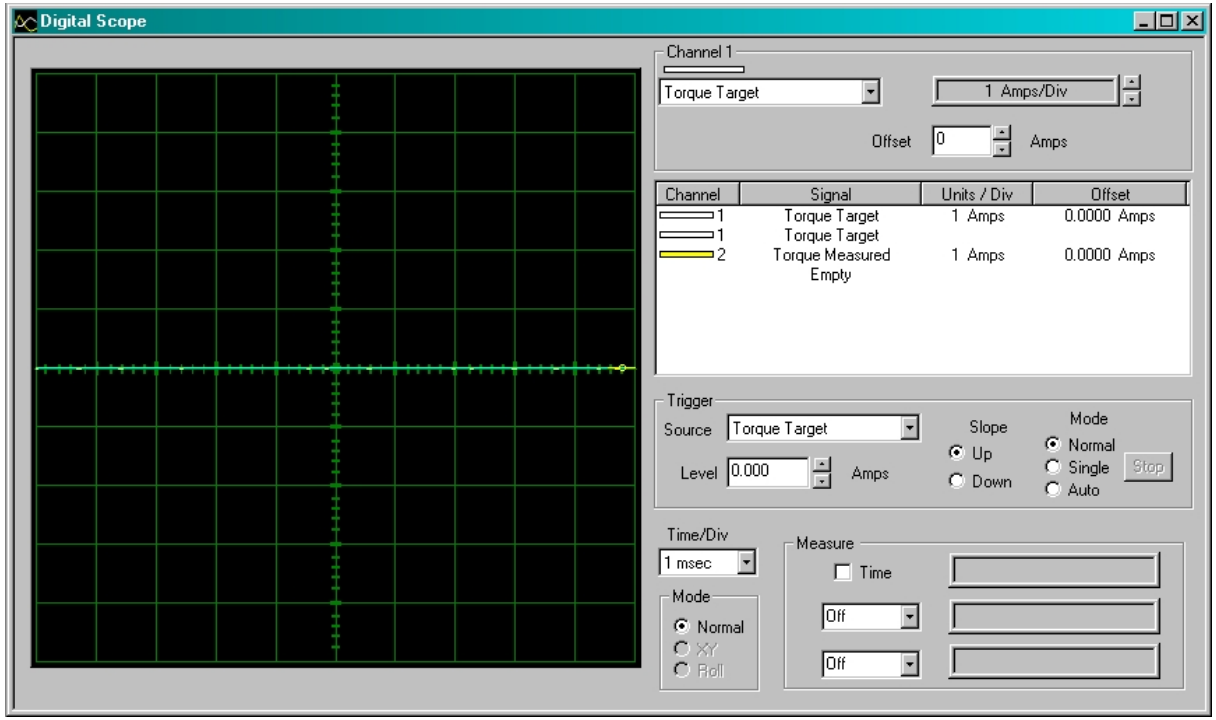
3. On the Main Block Diagram, click *Current Loop* to open the current loop tuning parameters.
4. To set starting values for proportional and integral gains, click the *Calculate Gains* button.
    a. **Note**: *Calculate Gains* utilizes the values entered into the Motor Data screen. Accuracy of the calculated values is determined by the accuracy of the motor data. If accurate motor winding data is not available, begin with *Proportional Gain* = 1, and *Integral Gain* = 0.



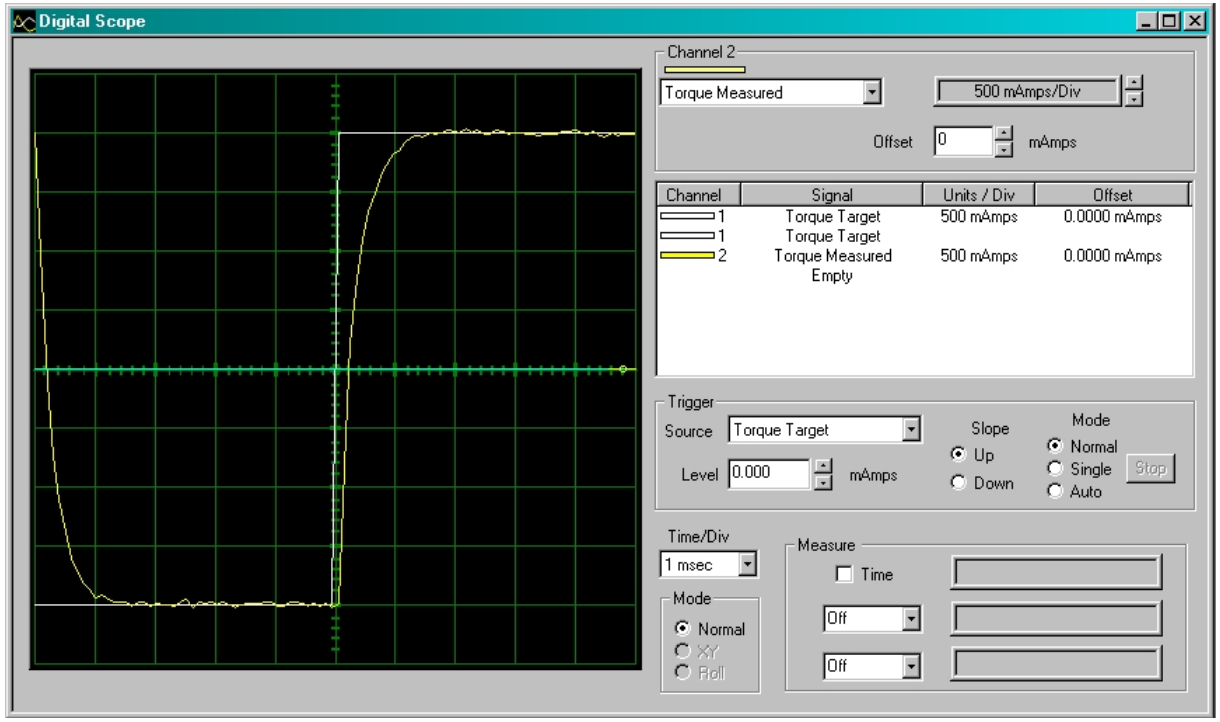
5. In the Current Loop window, click the *Waveform Generator* button (or select Tools → Waveform Generator on the menu bar) to open the Waveform Generator screen. Set up the Waveform Generator as follows:
    a. Select a *Square* Waveform Type.
    b. Set the frequency to 100Hz.
    c. Ensure *Offset* is zero.
    d. Ensure *Symmetry* is 50%.
    e. Select *Waveform into the Current Loop*
    f. Set the waveform amplitude to an appropriate value.
        i. Begin with ~10% of the drive continuous current rating, or ~50% of the continuous current setting, whichever is lower.



6. On the menu bar, select Tools → Oscilloscope to open the digital oscilloscope (or click the Oscilloscope icon .) Set up the scope view as follows:
    a. Use the drop down menu to change the channel 1 signal to *Torque Target*
    b. Use the drop down menu to change the channel 2 signal to *Torque Measured*
    c. Change the Trigger Source to *Torque Target* with the Level set to zero.
    d. Ensure Trigger Mode is *Normal*
    e. Change Time/Div to either 1 msec or 500 usec.
7. Position the Scope, Waveform Generator, and Current Loop windows such that a majority of all three windows is visible.
8. Enable the drive by clicking the *Enable/Disable Drive* icon .



9. Use the *Proportional Gain* and *Integral Gain* sliders or arrow buttons to adjust the T*orque Measured* waveform on the oscilloscope and match the *Torque Target* as closely as possible, without current overshoot.
10. On the Waveform Generator, readjust the current amplitude as necessary:
    a. For contouring applications, use a small signal amplitude (i.e. motion profile rms current.)
    b. For point-to-point applications, use a larger signal (i.e. continuous current limit.)
11. Readjust *Proportional Gain* and *Integral Gain* settings as necessary.
12. Disable the drive by clicking the *Enable/Disable Drive* icon .
13. When current loop gain adjustments are complete, click *Not Connected* on the Waveform Generator to remove the command signal from the drive.
14. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.

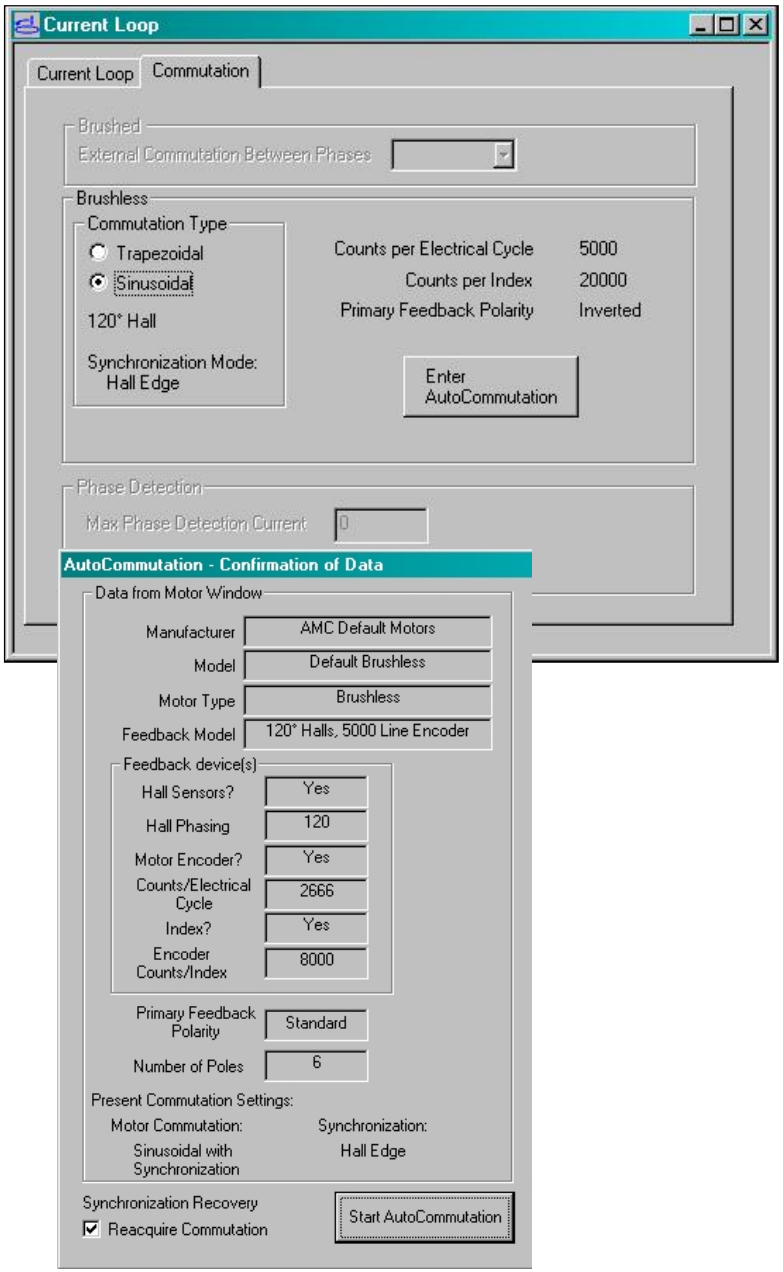


Auto Commutation

For brushless and linear motors with insufficient travel distance (two revolutions plus one electrical cycle for rotary motors, or three electrical cycles for linear motors), proceed to the section labeled *Manual Commutation.* For brushless and linear motors with sufficient travel distance, proceed as follows:

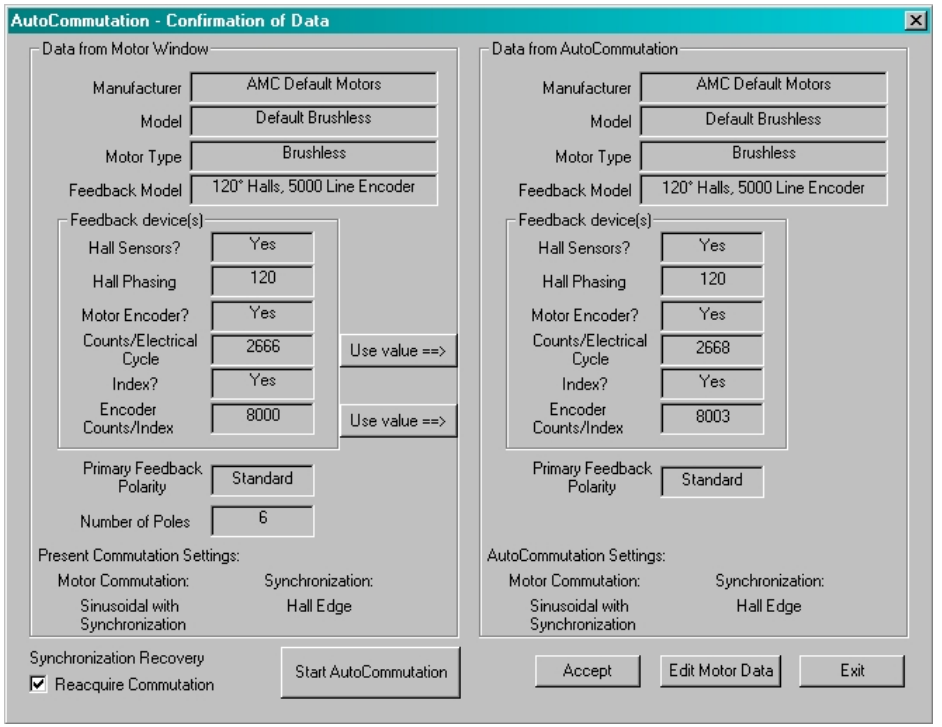
<u>Caution</u>: De-couple motor from any load and secure the motor. Sudden motion will occur.

1. In the Current Loop window, select the *Commutation* tab.
2. Ensure *Sinusoidal* commutation is selected.
3. Verify that indicated *Counts per Electrical Cycle* and *Counts per Index* values are correct. (The *Primary Feedback Polarity* will be determined during Auto Commutation.)
4. If drive is disabled, click the *Enable/Disable Drive* icon to enable the drive.
5. Click *Enter Auto Commutation* to open the Commutation Data window.
6. Ensure the *Reacquire Commutation* check box is checked.
7. Click *Start Auto Commutation* to begin the process.
    a. During the Auto Commutation process, monitor the distance traveled in each direction.
        i. Rotary motors will turn two revolutions plus one electrical cycle in each direction.
        ii. Linear motors will move three electrical cycles in each direction.



8. When detection is complete, select whether the motor has moved the proper distance ("Yes"), or has *not* moved the proper distance ("Edit Motor Data").
    a. If the motor did not move the proper distance, verify the pole count or pole pitch in the Motor Data window. Click OK in Motor Data to return to the Auto Commutation window.
9. Select the appropriate mode of commutation synchronization.
    a. For motors with hall sensor and encoder feedback select *Sinusoidal with Synchronization* and select *Hall Edge* for the synchronization signal. Click OK.
    b. For motors using encoder with index channel only or resolver, select *Sinusoidal with Synchronization* and select *Encoder Index* for the synchronization signal. Click OK.
10. In some cases, the Auto Commutation results will slightly differ from Motor Data (e.g. *Counts/Electrical Cycle*, *Counts/Index*). In those cases, you may choose between using the value determined by Auto Commutation or use the values from Motor Data ("Use Value").
11. Click *Accept* to apply the Auto Commutation parameters.
12. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.

Note: For brushless motors with encoder only feedback, the *Phase Detection* function must be utilized whenever power to the drive is cycled or a loss of sinusoidal commutation occurs. See *Phase Detection*.



Manual Commutation

In cases where system mechanical limitations prevent complete motion during Auto Commutation (e.g. linear motor with less than three torque cycles of travel), manual commutation must be performed as follows *in lieu of performing the Auto Commutation Procedure*

1. Ensure accuracy of Motor Data, most notably the values for Pole Count (Pole Pitch for linear motors) and Encoder Line Count.

   Note: If motor data is incorrectly entered and synchronization is not used, the motor may loose torque or force and eventually stall.

13. For motors with Encoder Only feedback, perform the *Phase Detect* function (see *Phase Detect*).

14. Determine the proper motor phasing as follows:

    a. Select *Tools → Waveform Generator*

    b. Set the Waveform Generator to apply a *DC Waveform* into the *Current Loop* with a zero *Offset*.

    c. Enable the drive using the *Enable/Disable* icon .

    d. On the *Waveform Generator*, apply enough *Offset* to start the motor shaft rotating (normally less than 0.25A).

       i. When phasing is correct, the motor should operate and reverse smoothly in both directions. If the motor runs slower in one direction or if you have to move the shaft to start the motor, the combination is incorrect.

    e. If the motor shaft seizes or runs rough, return the *Waveform Generator* offset to zero and disable the drive using the *Enable/Disable* icon .

    f. Change two of the motor phase wires (e.g. MA and MB) and repeat steps c through e. Proceed through all six possible motor phase combinations.

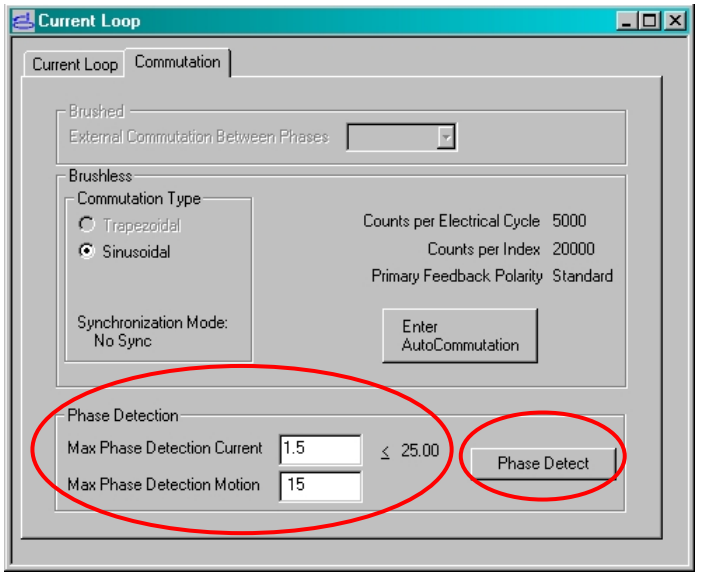
    Note: For brushless motors with encoder only feedback, the *Phase Detection* function must be utilized whenever power to the drive is cycled or a loss of sinusoidal commutation occurs. See *Phase Detect*.

Trial	MA	MB	MC
1	A	B	C
2	B	A	C
3	B	C	A
4	C	B	A
5	C	A	B
6	A	C	B

Phasing Combinations

Phase Detect

If a rotary or linear motor with encoder only feedback or an absolute encoder with serial interface is used, the *Phase Detect* function must be used any time the drive is powered up or there is a loss of sinusoidal commutation to determine motor position.

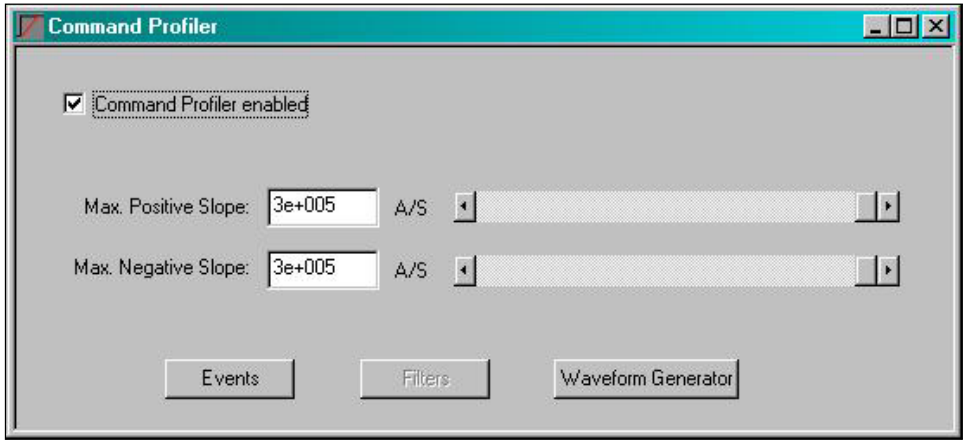


1. From the main Block Diagram, open the *Current Loop* window. Select the *Commutation* tab.
2. Enter the *Max Phase Detection Current* (Amps) and *Max Phase Detection Motion* (electrical degrees).
    a. *Max Phase Detection Current* is empirically determined. For most uncoupled motors, approximately 0.5 to 0.75A will suffice.
3. To activate Phase Detect from within DriveSuite, proceed as follows:
    a. From the main Block Diagram, open *DriveStatus*.
    b. Enable the drive using the *Enable/Disable* icon .
    c. Click the *Phase Detect* button on the *Commutation* tab of the *Current Loop*.
    d. Monitor the *Phase Detect Complete* indication in *Drive Status*. When this indication is activated, click *End Phase Detect*.
4. To activate Phase Detect via external trigger of a digital input, proceed as follows:
    a. From the main Block Diagram, open the *I/O Configuration* window and select the *Digital Inputs* tab.
    b. Assign the appropriate Digital Input to the *Phase Detection* function and, if necessary, select *Active Low*.
    c. For *Phase Detect Complete* indication, assign the appropriate Digital Output and, if necessary, select the *Active Low* check box. Click "OK" to close the *I/O Configuration* window.
    d. Enable the drive.
    e. Activate the appropriate digital input to begin the Phase Detect process. The motor will slightly vibrate back and forth.
    f. When motion is complete (*Phase Detect Complete* indication in *Drive Status*), deactivate the digital input to terminate Phase Detect.

Current Loop Command Profiling

While in torque mode, Current Loop Command Profiling can be used to limit the rate of change of current and, subsequently, the rate of change of acceleration (commonly referred to as "jerk").

1. From the Main Block Diagram, open the *Command Profiler.*
2. Activate the check box for *Command Profiler Enabled*.
3. Using the slider bars or numerical entry, enter a value for the maximum change in current (amps per second). Different values can be entered for both positive and negative slopes (dI/dt).



Note: To use the command profiler when utilizing the Waveform Generator, select the *Waveform Into the: Command Profiler*. The output of the Command Profiler, while in Torque Mode, is the *Target Torque*.

Velocity Loop Tuning

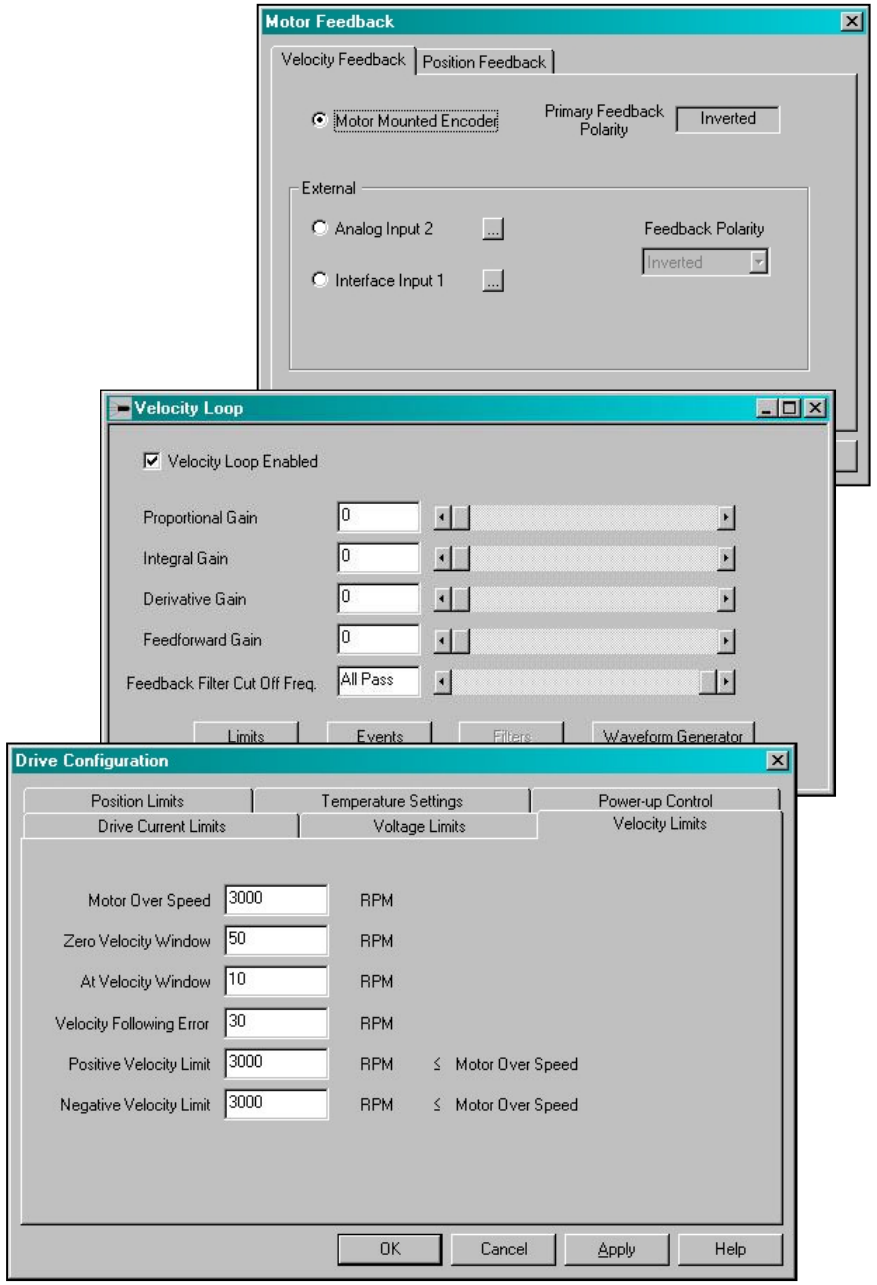
Note: Digiflex® servo drive Velocity Loop control is not supported by SynqNet™.

Note: Velocity loop tuning is dependant on the mechanical load of the motor and, therefore will change with any mechanical system changes. Velocity loop tuning should be performed with the motor installed in the system.

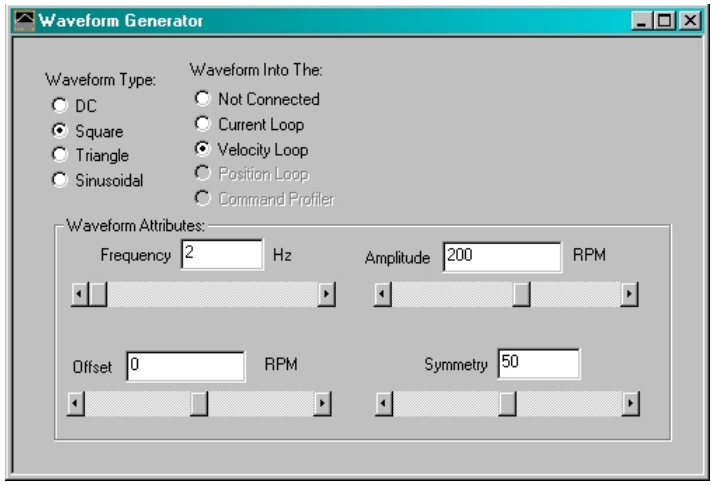
1. Verify that the drive is disabled ( ).
2. From the Main Block Diagram, open the Feedback window and select the *Velocity Feedback* tab.
3. Select the appropriate velocity feedback source. Click "OK".

   Note: If Auto Commutation was performed, the velocity feedback polarity has been automatically determined.
4. From the Main Block Diagram, open the *Velocity Loop* window.
5. Select the check box for *Velocity Loop Enabled*.
6. In the *Velocity Loop* window, click the *Limits* button to open the *Velocity Limits* tab in *General Drive Configuration*.
7. Enter values for *At Velocity Window, Velocity Following Error, Positive Velocity Limit,* and *Negative Velocity Limit*.

   Note: Velocity limit values cannot exceed the Maximum Speed rating of the motor (from the Motor Data window).
8. Click "OK" to accept values and close *General Drive Configuration*.



9. In the *Velocity Loop* window, click the *Waveform Generator* button to open the Waveform Generator.



10. With the Waveform Generator, establish a *Square* wave into the *Velocity Loop* with an amplitude of approximately 10% of nominal motor speed. The *Frequency* should be slow enough to achieve the commanded velocity, but fast enough to prevent the system from reaching a mechanical limit (e.g. 2-3Hz).

    Note: The accuracy of velocity loop tuning is dependant on the quality and resolution of the velocity feedback. Sources with relatively low resolution or higher noise will require tuning at a higher velocity in order to overcome the effects of these limitations. It is best to experimentally determine the optimum tuning setup.

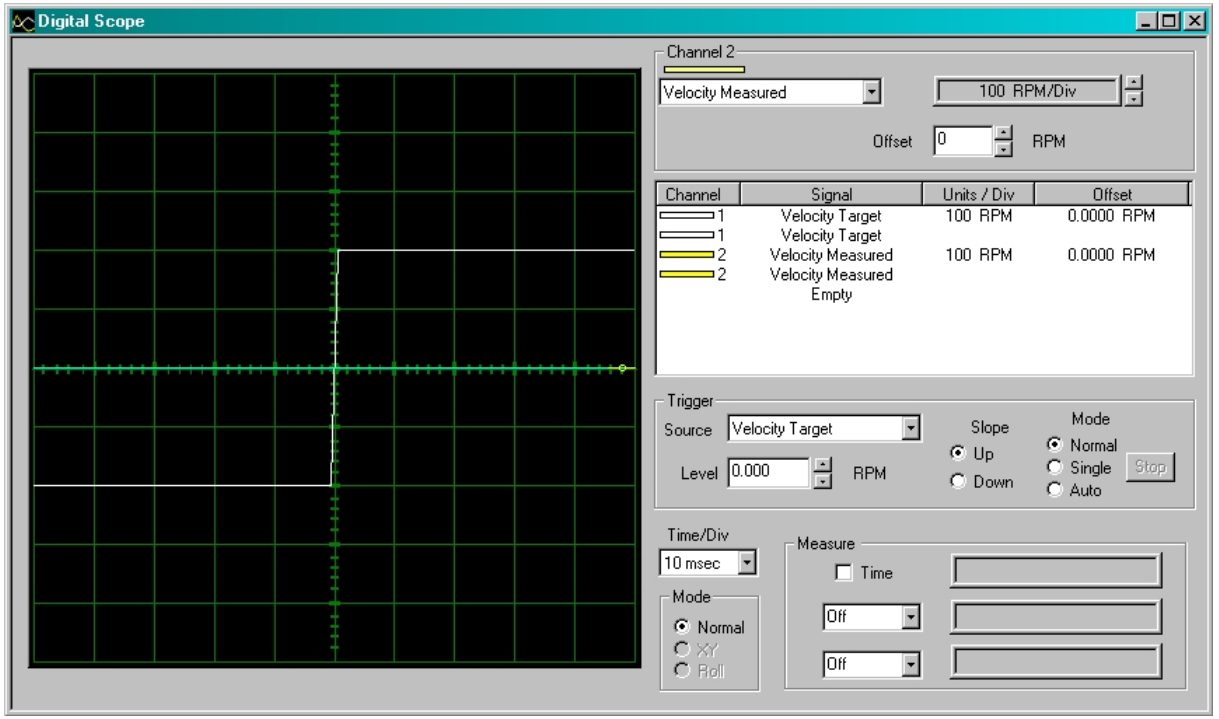
11. On the menu bar, select Tools → Oscilloscope to open the digital oscilloscope (or click the Oscilloscope icon .) Set up the scope view as follows:

    a. Use the drop down menu to change the channel 1 signal to *Velocity Target*

    b. Use the drop down menu to change the channel 2 signal to *Velocity Measured*

    c. Change the Trigger Source to *Velocity Target* with the *Level* set to zero.

12. Ensure Trigger Mode is *Normal*

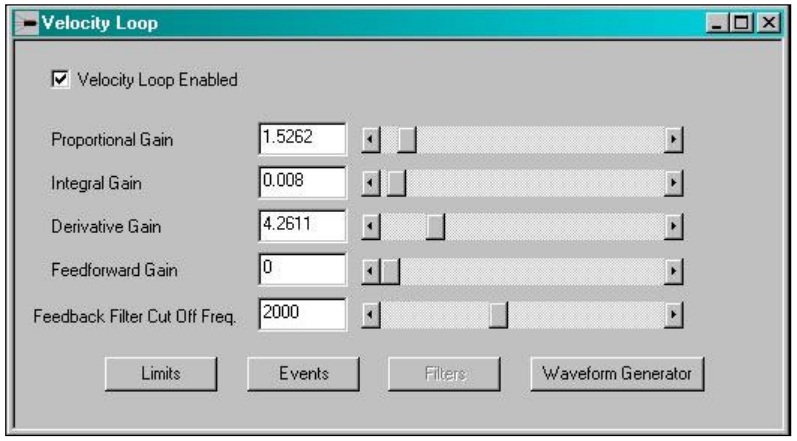


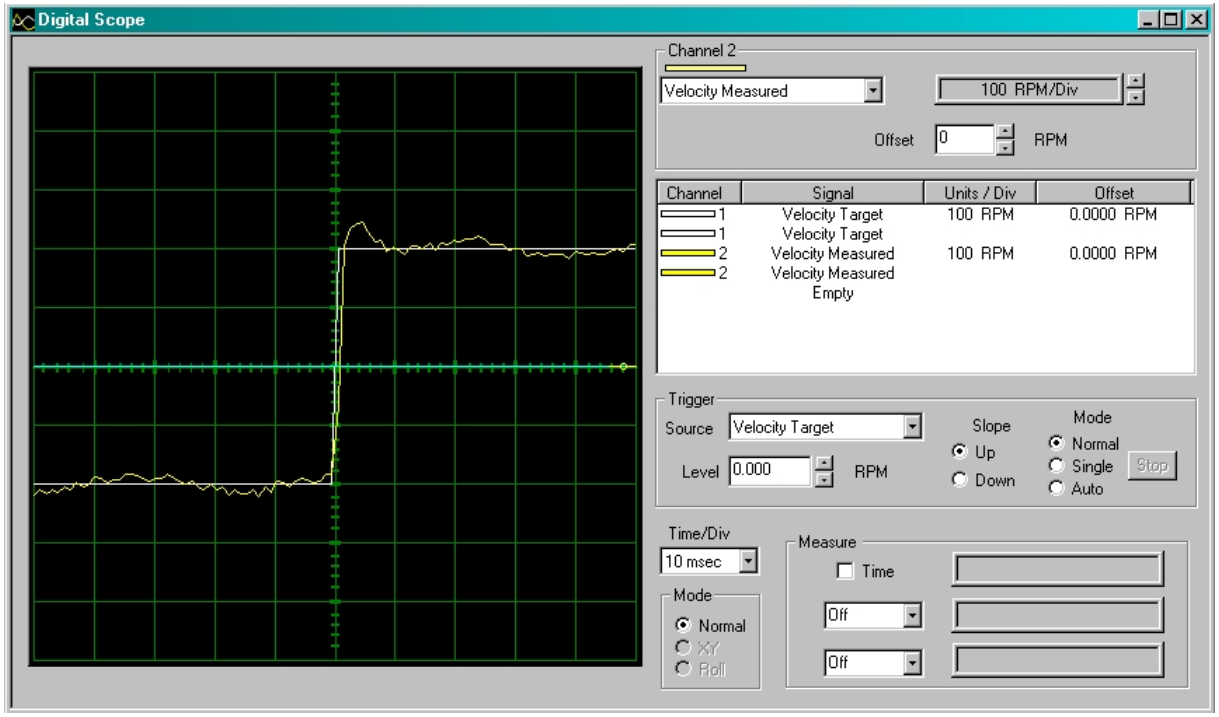
13. Enable the drive by clicking the *Enable/Disable Drive* icon .

14. Use the *Proportional Gain*, *Integral Gain*, *Derivative Gain*, *Feedforward Gain*, and *Feedback Filter Cut Off Frequency* sliders or arrow buttons to adjust the *Velocity Measured* waveform on the oscilloscope and match the *Velocity Target* as closely as possible.

    Note: While reducing the value of the *Feedback Filter Cut Off Frequency* can be used to minimize the effects of noise and enhance stability, a higher value will increase system response and bandwidth. The final tuning must be empirically determined as a compromise between the two results.

    The effect of the *Feedback Filter Cut Off Frequency* can be seen by comparing the *Velocity Feedback* (unfiltered) and *Velocity Measured* (filtered) signals on the oscilloscope.



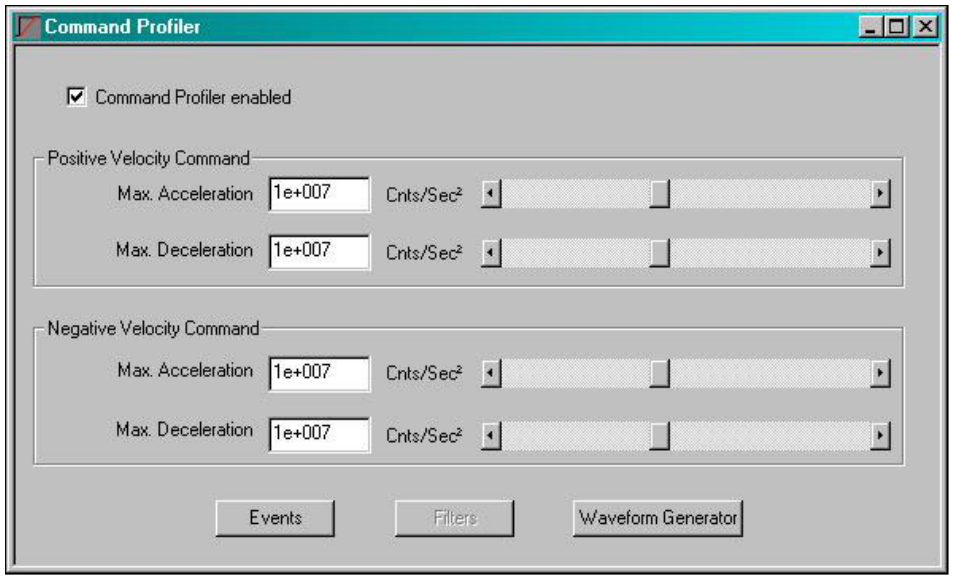


15. When tuning is complete, disable the drive with the *Enable/Disable Drive* icon and select *Not Connected* on the Waveform Generator.

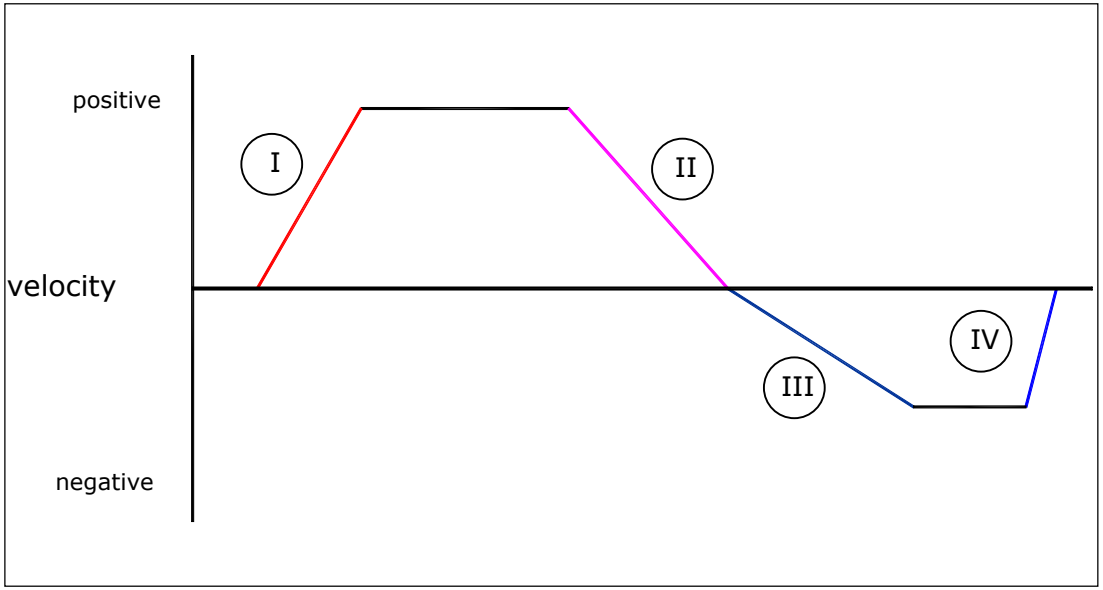
16. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.

Velocity Loop Command Profiling

While in velocity mode, Velocity Loop Command Profiling can be used to limit the rate of change of velocity or apply a constant acceleration to step velocity commands. The command profiler provides independent control of acceleration and deceleration in both the positive and negative velocity directions.



1. From the Main Block Diagram, open the *Command Profiler.*
2. Activate the check box for *Command Profiler Enabled*.
3. Using the slider bars or numerical entry, enter values for the maximum changes in velocity (counts/sec^2). Independent values can be entered for both acceleration and deceleration in both the positive and negative directions.



I. Positive velocity, acceleration

II. Positive velocity, deceleration

III. Negative velocity, acceleration

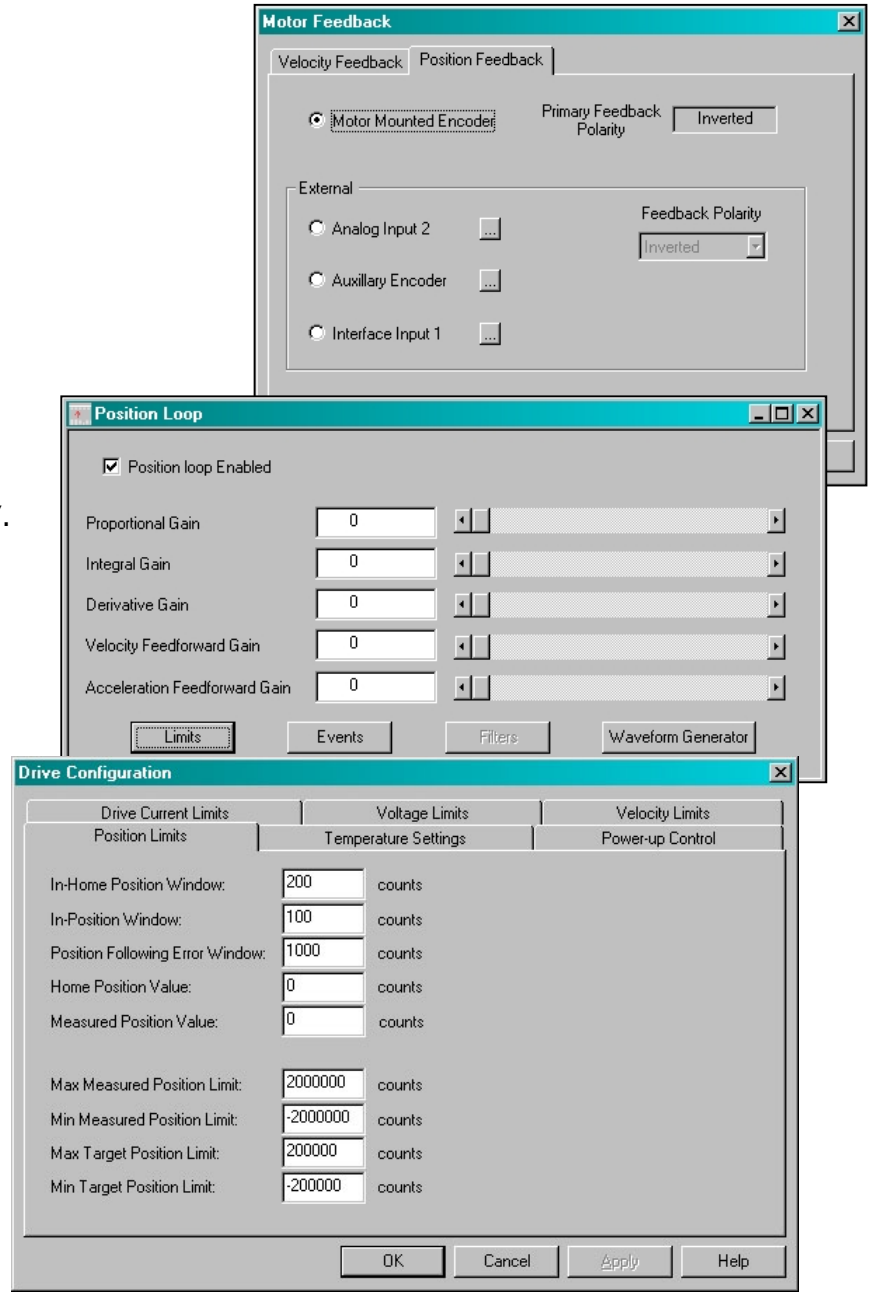
IV. Negative velocity, deceleration

Position Loop Tuning

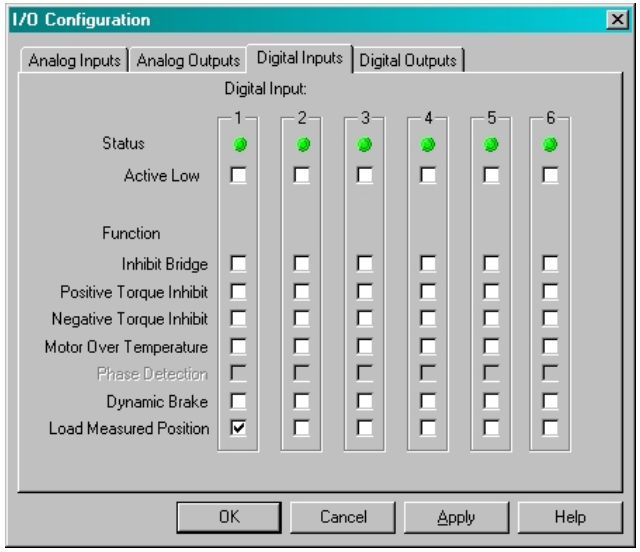
Note: Digiflex® servo drive Position Loop control is not supported by SynqNet™.

Note: Position loop tuning is dependant on the mechanical load of the motor and, therefore will change with any mechanical system changes. Position loop tuning should be performed with the motor installed in the system.

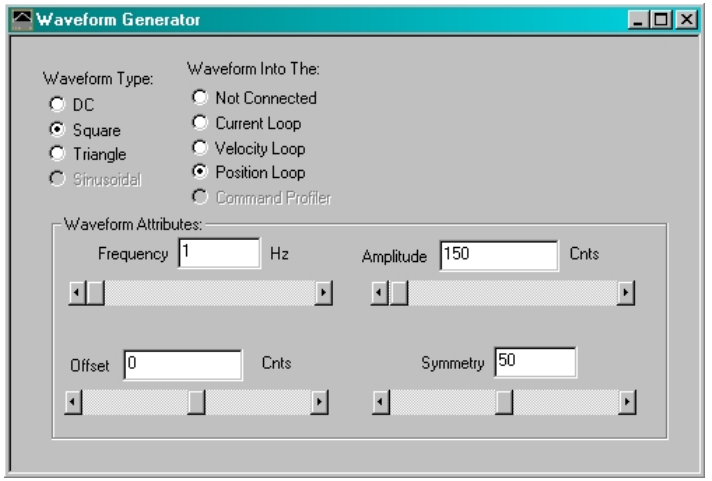
1. Verify that the drive is disabled ( ).
2. From the Main Block Diagram, open the Feedback window and select the *Position Feedback* tab.
3. Select the appropriate position feedback source. Click "OK".
4. For $1V_{p-p}$ sin/cos encoders, select the level of interpolation (pre-quadrature).
5. From the Main Block Diagram, open the *Position Loop* window.
6. Select the check box for *Position Loop Enabled*.
7. In the *Position Loop* window, click the *Limits* button to open the *Position Limits* tab in *General Drive Configuration*.
8. Enter values for *In Position Window*, *Position Following Error Window*, and *Max* and *Min Target Position Limit*.
9. Set the *Measured Position Value* to *zero* (0) counts.
10. Click "OK" to accept values and close *General Drive Configuration*.



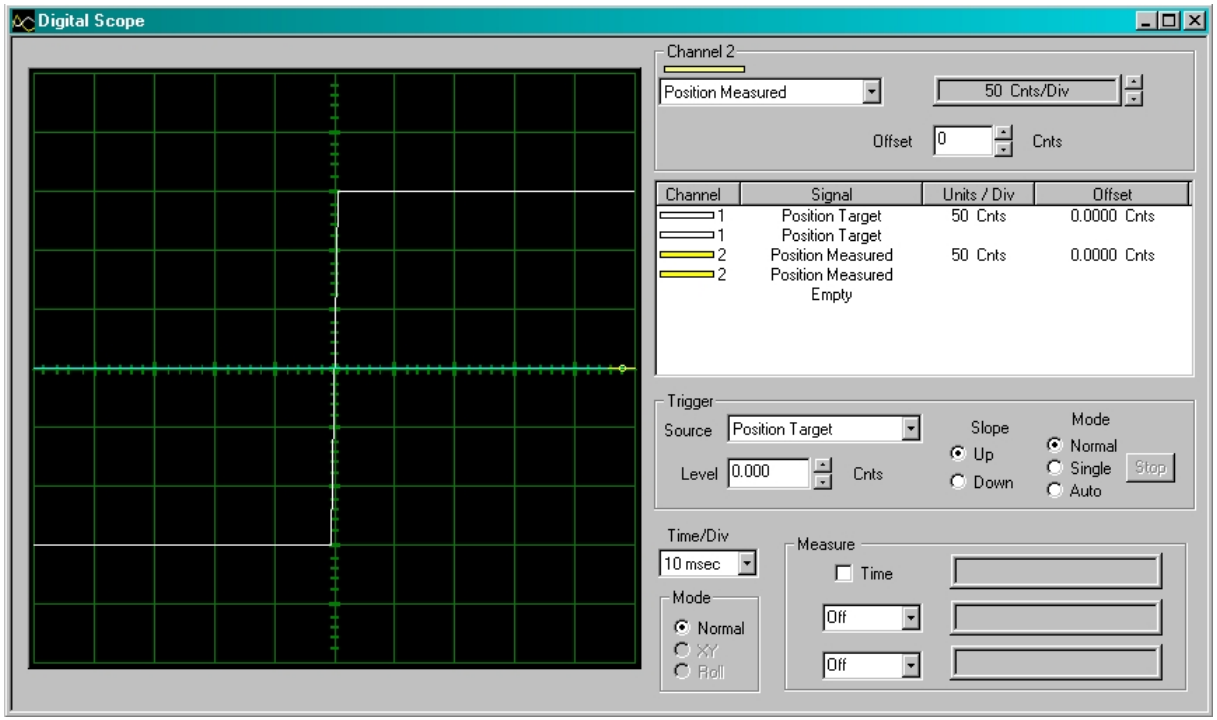
11. From the Main Block Diagram, click *I/O Configuration* and select the *Digital Inputs* tab.
12. Set the Measured Position to zero by checking *Load Measured Position* under an unassigned input and click the *Apply* button.
13. Clear the check box checked in step 12 and once again click *Apply*.
14. Click OK to close the *I/O Configuration* window.



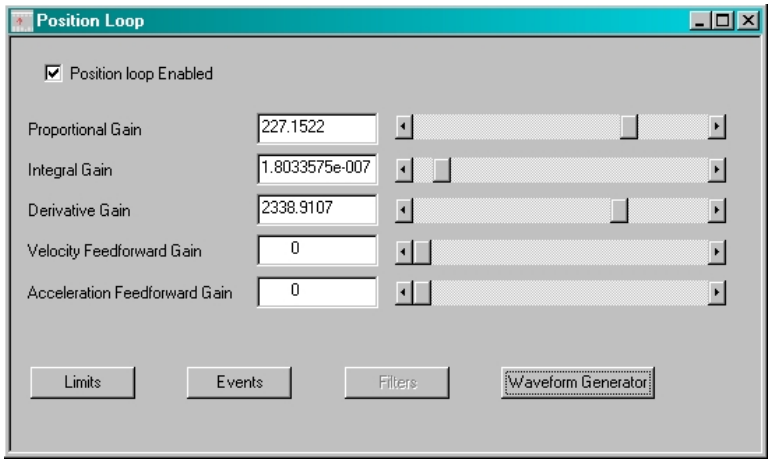
15. In the *Position Loop* window, click the *Waveform Generator* button to open the Waveform Generator.
16. With the Waveform Generator, establish a *Square* wave into the *Position Loop* with an amplitude of approximately 1/8 of one revolution. The frequency should be slow enough to allow the motor to settle in position (e.g. 1-2Hz).

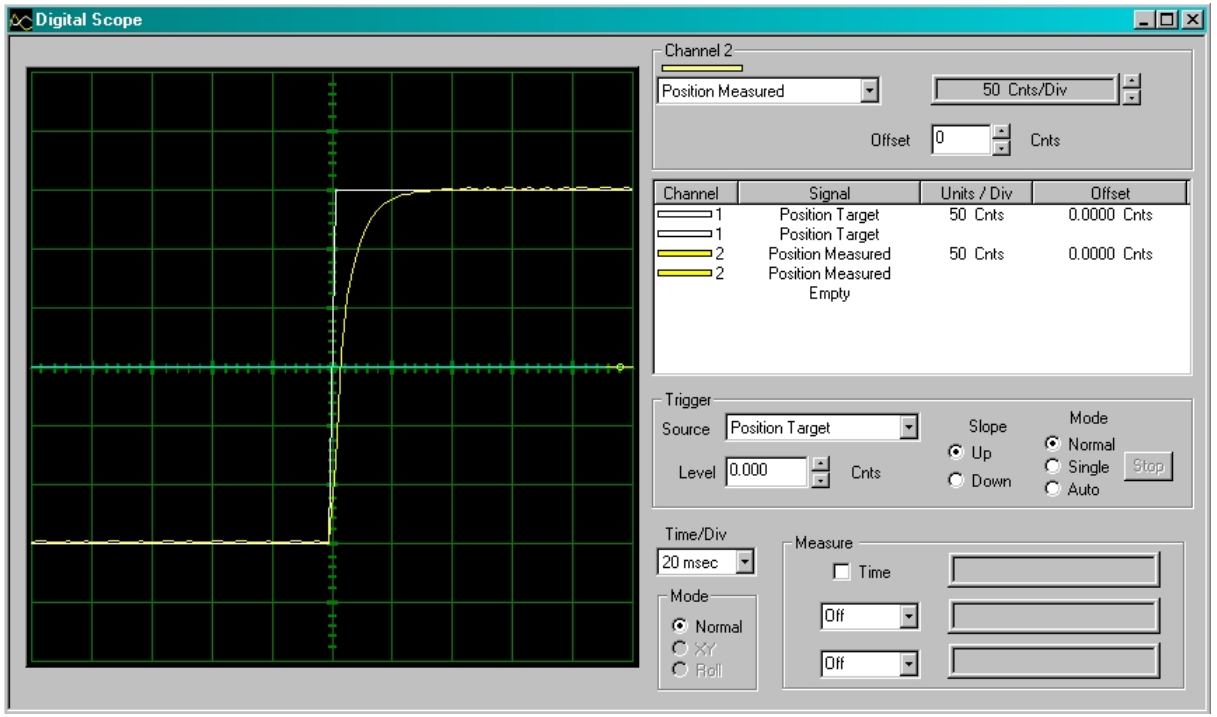


17. On the menu bar, select Tools → Oscilloscope to open the digital oscilloscope (or click the Oscilloscope icon .) Set up the scope view as follows:
    d. Use the drop down menu to change the channel 1 signal to *Position Target*
    e. Use the drop down menu to change the channel 2 signal to *Position Measured*
    f. Change the Trigger Source to *Position Target* with the *Level* set to zero.
18. Ensure Trigger Mode is *Normal*.



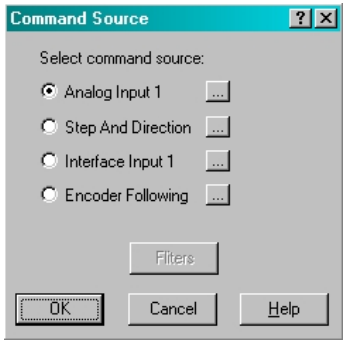
19. Enable the drive by clicking the *Enable/Disable Drive* icon .
20. Use the *Proportional Gain*, *Integral Gain*, *Derivative Gain*, *Velocity Feedforward Gain*, and *Acceleration Feedforward Gain* sliders or arrow buttons to adjust the *Position Measured* waveform on the oscilloscope and match the *Position Target* as closely as possible.
21. When tuning is complete, disable the drive with the *Enable/Disable Drive* icon and select *Not Connected* on the Waveform Generator.
22. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.





Command Source Selection

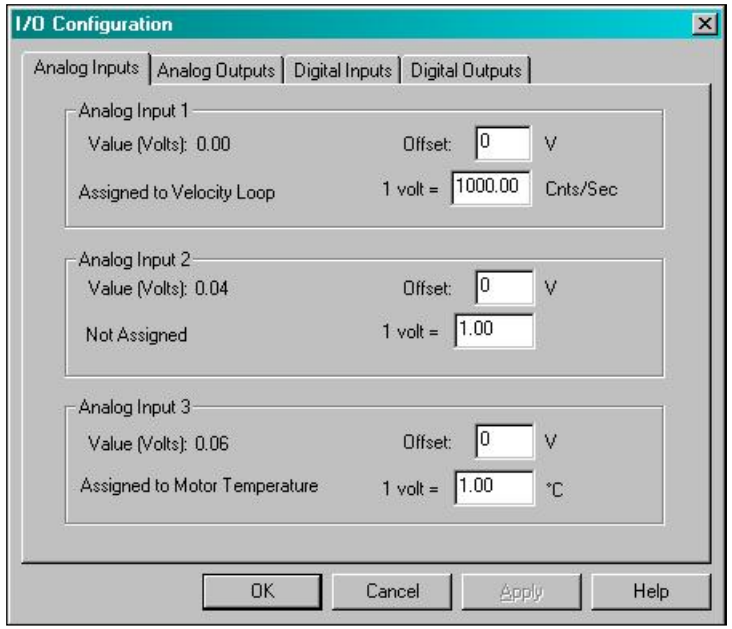
Note: For the DQ111 series, the Command Source is automatically selected to the SynqNet™ network interface.



1. Select the command source as follows:
2. In the Block Diagram window, select the *Command Source* block.
3. Select the appropriate command source
    a. Analog Input (torque, velocity, or position)
    b. Step and Direction (torque, velocity, or position)
    c. Interface Input (torque, velocity, or position)
    d. Encoder Following (position)
4. Clicking the selection button, ..., accesses additional parameters such as step and direction scaling or selection of a specific analog input.
5. Click *OK* on the Command Source window.

Analog Input Scaling

1. Set the analog command scaling as follows:
    a. In the Block Diagram window, select *I/O Configuration*.
    b. For the appropriate Analog Input, (as previously selected,) set the required scaling (e.g. Amps/Volt, Cts/sec/Volt) and command offset voltage.
    c. Command polarity can be inverted by changing the sign (+/-) on the Analog Input scaling.
    d. Click *Apply* or *OK* to set any modified values.
2. On the Menu Bar, select *Communication* → *Store* (or click the *Store Settings* icon), then OK to store parameters to the drive nonvolatile memory.
3. The Analog Input may now be used to apply a current, velocity, or position command to the drive.



Further assistance is available through any of the following:

- DriveSuite Help files
- www.a-m-c.com
- Technical Assistance via phone: 805-389-1935
- Technical Assistance via e-mail: techsupport@a-m-c.com.

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